Claims:

1. An iodine injection system for injecting iodine into a nozzle for a laser, wherein the nozzle is a symmetric two dimensional minimum length nozzle with a curved sonic line that has a throat and an exit plane, comprising at least one strut that is located downstream of the nozzle throat.

2. The iodine injection system according to claim 1 wherein a stream comprising oxygen flows through the nozzle and an upstream edge of the strut is perpendicular to the velocity of the stream.

3. The iodine injection system according to claim 2 wherein the upstream edge of the strut is a sharp wedge with an angle less than 45^{o}.

4. The iodine injection system according to claim 3 wherein the sharp wedge has an angle of 20^{o} or less.

5. The iodine injection system according to claim 1 wherein the strut has a coating on its outer surface.

6. The iodine injection system according to claim 1 wherein the nozzle has a kernel region and the strut is located near the downstream end of the kernel region.

7. The iodine injection system of claim 6 wherein the downstream edge of the kernel region is located between 10% to 50% of the distance from the throat and the exit plane.

8. The iodine injection system according to claim 1 wherein the strut is located in the region that is between the nozzle throat and exit plane.

9. The iodine injection system of claim 1 wherein the strut is located within 20% to 50% of the distance between the nozzle throat and the exit plane.

10. The iodine injection system according to claim 1 wherein the strut comprises an iodine feed duct and at least one orifice through which the iodine exits the feed duct.

11. The iodine injection system according to claim 10 wherein the feed duct has two ends and is manifolded for iodine feed from both ends.

12. The iodine injection system according to claim 10 wherein the at least one orifice is circular.

13. The iodine injection system according to claim 10 wherein the at least one orifice is oval.

14. The iodine injection system according to claim 11 wherein the iodine feed includes a carrier gas.

15. The iodine injection system according to claim 1 wherein the nozzle has walls and the height of the strut between the nozzle walls is about 2 cm to about 50 cm.

16. The iodine injection system according to claim 1 wherein the width of a strut is about 2 mm to about 10 mm.

17. The iodine injection system according to claim 16 wherein the diameter of an injected iodine plume is equal to or less than the width of the strut.

18. The iodine injection system according to claim 1 wherein there are at least two struts that are sufficiently spaced apart to reduce the amount of bow shock from one strut from impinging on an adjacent strut.

19. The iodine injection system according to claim 18 where the struts spaced apart by about 0.5 cm to 4 cm.

20. The iodine injection system according to claim 1 wherein the strut has at least one fin on its downstream face.

21. The iodine injection system according to claim 2 wherein the upstream edge of the strut is a sharp ogive.

22. The iodine injection system according to claim 3 wherein the sharp ogive has an angle of 20° or less.

23. The iodine injection system according to claim 1 wherein a carrier gas is injected with the iodine.

24. The iodine injection system according to claim 23 wherein the carrier gas is helium.

25. The iodine injection system according to claim 23 wherein the carrier gas is nitrogen.

26. The iodine injection system according to claim 1 wherein there are at least two struts, the second strut being located further downstream in the nozzle than the first.

27. The iodine injection system according to claim 1 wherein there are at least two struts that are staggered between the nozzle throat and the exit plane.

28. The iodine injection system according to claim 1 wherein the strut further comprises a heating element.

29. An iodine injection strut comprising:

an upstream edge that is a sharp wedge less than 45°;

an iodine feed duct manifolded for iodine feed from a top and a bottom end of the strut;

at least one orifice for injecting iodine; and

a heating element.

30. The iodine injection strut according to claim 29 wherein the sharp wedge has an angle of 20° or less.

31. The iodine injection strut according to claim 29 further comprising a coating on the exterior surface of the strut.

32. The iodine injection strut according to claim 31 wherein the coating is Teflon.

33. The iodine injection strut according to claim 31 wherein the coating is a plastic material.

34. The iodine injection strut according to claim 29 wherein the strut is located in a nozzle for a COIL and the nozzle has a throat and an exit plane.

35. The iodine injection strut according to claim 34 wherein the strut is located near the nozzle throat.

36. The iodine injection strut according to claim 34 wherein the strut is located between 10% to 50% of the distance between the throat and exit plane.

37. The iodine injection system according to claim 29 wherein

the at least one orifice is circular.

38. The iodine injection strut according to claim 10 wherein at least one orifice is oval.

39. The iodine injection strut according to claim 29 wherein the strut has at least one fin on its downstream face.

40. The iodine injection system according to claim 34 wherein the nozzle is a symmetric two dimensional minimum length nozzle with a curved sonic line.

41. A nozzle for a COIL comprising a symmetric two dimensional minimum length nozzle with a curved sonic line.

42. The minimum length nozzle according to claim 41 further comprising a short converging nozzle section.

43. The minimum length nozzle according to claim 41 further comprising a throat, a wall, and an exit plane.

44. The minimum length nozzle according to claim 43 further comprising a gas injection strut located between the nozzle throat and exit plane.

45. The minimum length nozzle according to claim 44 wherein the upstream edge of the strut is a sharp wedge.

46. The minimum length nozzle according to claim 45 wherein the sharp wedge has an angle of 20° or less.

47. The minimum length nozzle according to claim 44 wherein the strut is coated with Teflon.

48. The minimum length nozzle according to claim 44 wherein iodine is injected through the gas injection strut.

49. The minimum length nozzle according to claim 48 wherein a carrier gas and iodine are injected through the gas injection strut.

50. The minimum length nozzle according to claim 43 further comprising a transition area between the throat and the wall.

51. The minimum length nozzle according to claim 50 wherein the transition area has an angle of about 10° – 25° upstream of the throat.

52. The minimum length nozzle according to claim 41 wherein there is a thin fluid boundary layer along the wall.

53. The minimum length nozzle according to claim 52 wherein the Reynolds number at the throat is 10^4 to 10^6.

54. The minimum length nozzle according to claim 41 wherein the width of the nozzle does not need to increase when the pressure in the COIL laser cavity decreases.

55. A system for delivering singlet oxygen and iodine to a COIL laser cavity comprising:

a singlet oxygen generator;

a symmetric two dimensional minimum length nozzle with a curved sonic line; and

at least one iodine injection strut.

56. The system according to claim 55 wherein the singlet oxygen generator is part of a plenum for the nozzle and wherein the at least one iodine injection strut is located downstream of a throat for the nozzle.